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Report on the AAAS Forum on Science and Technology Policy

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1 Introduction

A two-day Forum on Science and Technology Policy was held by the American Association for the Advancement of Science (AAAS)*1 on May 3 and 4, 2007, in Washington, DC. This policy forum has been held every spring since 1976. This year's was the 32nd[1]. (The name was changed from "colloquium" to "forum" beginning in 2004.)

This policy forum differs from the large AAAS Annual Meeting where symposiums on a variety of themes are held. The number of sessions and themes are limited, and the forum takes up issues facing the US science and technology community, such as trends and areas of policy emphasis in Congressional debate on the science and technology budget and recent changes in status. It provides an important opportunity for scientists, relevant government officials etc. to meet together and discuss these issues with shared awareness.

This year, over 400 people participated, including government officials such as John H. Marburger, III, Science Advisor to the President (and Director, White House Office of Science and Technology Policy), who attended for the sixth straight year; members of the legislative branch including Bart Gordon, Member, US House of Representatives (Democrat, Tennessee), chairman, House Committee on Science and Technology; university educators and researchers; researchers and analysts from relevant think tanks; members of relevant academic societies; and people involved with science and technology policy in other countries. The themes for this year were as follows[2].

Plenary Sessions

- Budgetary and Policy Context for R&D in FY 2008
- Pharmaceutical and Biotechnology R&D
- Sequestered Science

Concurrent sessions

- States' Expanding Roles in Science and Technology
- Building Science, Technology, and Innovation Capacity in Developing Nations
- Surveillance, Privacy, and the Roles of Science and Technology

This article will report on the main points discussed at the policy forum.

2 AAAS analysis of Federal budget proposals for R&D in FY 2008

The Federal budget request released in the President's FY 2008 budget message on February 5, 2007, was $2.902 trillion, with a Federal R&D budget of $143 billion. This is a 1.3 percent increase from FY 2007[3]. Of this, 58 percent (around $82.9 billion) is for defense-related R&D, with the remaining 42 percent (about $60 billion) going to non-defense R&D. The Department of Defense (DoD) R&D budget accounts for about 95 percent of the defense-related R&D budget. The total represents a 1.0 percent increase from the previous fiscal year's budget of $78.996 billion. The budget for weapons development in particular increased 5.5 percent, to $68.1 billion. On the other hand, the science and technology budget including DoD basic and applied research is on a downward trend, falling 20.1 percent to $10.9 billion. (However, the science and technology budget accounts for only about 14

percent of the DoD R&D budget.)

AAAS R&D Budget and Policy Program Director Kei Koizumi reported that because of the Bush Administration's goal of erasing the deficit and balancing the budget by 2012, the Federal R&D budget as whole, with the exception of budget related to the American Competitiveness Initiative (ACI), will be cut in FY 2008, as it was in FY 2007. In concrete terms, high priority is still given to target organizations in the ACI's second year, the U.S. Department of Energy Office of Science (DOE-OS), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST) (laboratory portion), while the R&D budgets of other organizations remain the same or decrease. Even the National Institutes of Health (NIH) are down 1.2 percent. Furthermore, it is strikingly clear that while the basic and applied research budget is falling, the development budget is rising. Within the Federal R&D budget, basic research is down 0.2 percent ($28.2 billion), applied research is down 4 percent ($27.1 billion), but the development budget is up 2.9 percent ($82.8 billion). The increase in the DoD development budget has a major influence on this. (See Figures 1 and 2.)

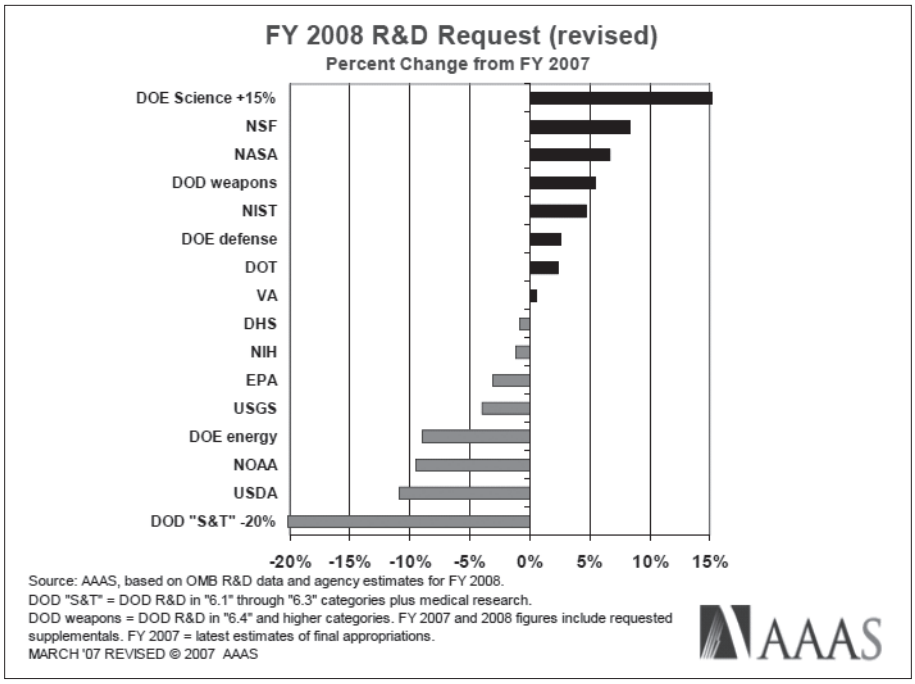

Figure 1 : Percent change (from FY 2007) in FY 2008 R&D budget requests of various agencies

From Kei Koizumi, "Federal R&D Investments in the FY 2008 Budget"

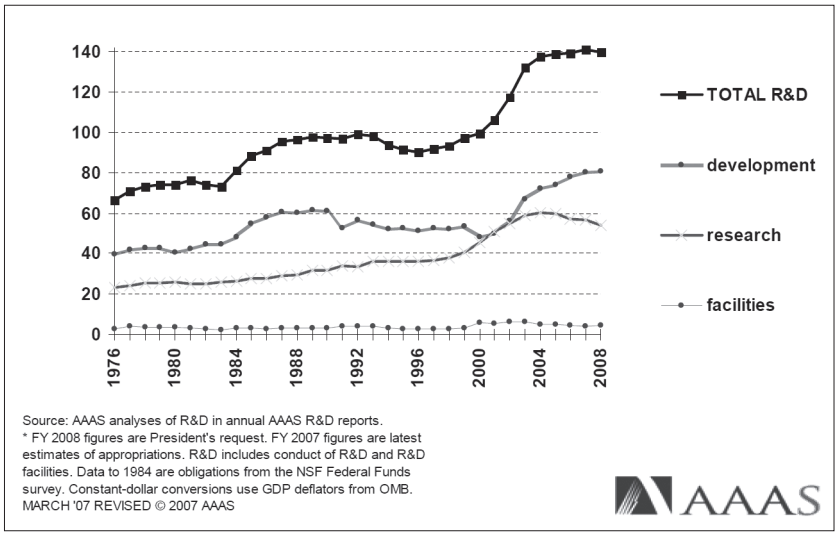

Figure 2 : R&D budgets (FY 1976–2008)

From Kei Koizumi, "Federal R&D Investments in the FY 2008 Budget"

In addition, interest in climate change is rising, and even though President Bush's positive environmental policy, FY 2008 expenditures for the Climate Change Science Program (CCSP) are down 7.4 percent. According to Mr. Koizumi, this is because of the lower budget for NASA, which is the largest sponsor of climate change science.

3 Science and technology issues facing the USA

3-1 Speech by John H. Marburger, Science Advisor to the President

This was Mr. Marburger's sixth keynote address. He spoke about issues facing the US science and technology community and trends in the Federal R&D budget. His main points were as follows.

- **Diverse research funding sources and new business models required by universities**

The NIH's R&D budget doubled over the five years ending in FY 2003, bringing about an increase in the number of researchers. It will be difficult to maintain this rapidly expanded number of researchers using the conventional business model. Today, with competition for shares of the Federal budget intensifying, university research is beginning to diversify funding sources by turning to new business models such as building new relationships with private-sector sponsors. The Federal Government is encouraging such changes. Furthermore, future Federal R&D budgets are not expected to grow rapidly enough to meet the expanding scale of research. Further examination of mutual collaboration among Federal, state, and private funding is necessary.

- **Concern over and government action to mitigate the negative impacts of security measures**

As for the negative impacts of security measures on science since the 9/11 terrorist attacks, the situation regarding the issuing of student visas has greatly improved. However, serious issues remain, including the clumsy visa process for visiting scientists, implementation of an excessive export control regime, over-regulation of dual-use bioscience, and security measures at national laboratories that stifle user programs. At the same time, however, the government has formed numerous interagency committees to address the issues and seek solutions. For example, the National Science Advisory Board for Biosecurity (NSABB) formed in 2004 (in April 2007 it published a report entitled "Proposed Strategies for Minimizing the Potential Misuse of Life Sciences Research") is working on the problem of dual-use bioscience by examining guidelines on restricting the publication of scientific information that requires cautious handling. Furthermore, the Department of Commerce is also working on the problem of export regulations. The media should pay more attention to these efforts.

- **Efforts directed towards new science and technology benchmarks: a "science of science policy"**

In 2005 in this policy forum, I argued that the ratio of Federal R&D budget to GDP is not necessarily an effective indicator of a nation's science strength and that a new "science of science policy" with more quantitative benchmarks is necessary. In response, the NSF launched a "science of science policy" program inside the USA. I am also impressed by the fact that the OECD has taken up the discussion internationally[4].

- **Criticism of the AAAS budget analysis**

In the AAAS report on the FY 2008 Federal budget, there is an important failure in the treatment of earmarks*2. The report states that there would be steep cuts in the FY 2008 DoD science and technology (S&T) programs (20.1 percent from the previous year). (See Chart 1.) This report, however, does not accurately reflect recent debate on earmarks. It misinforms the readers of the AAAS report, which is widely used as an authoritative reference of the budget.

Last year in this policy forum as well, I pointed out that earmarks had rapidly increased during the past five years, to the point where it now threatens the missions of the agencies whose funds have been directed toward purpose that do not support the agency workplans. I urged

the AAAS to work with the White House Office of Science and Technology (OSTP) and the White House Office of Management and Budget (OMB) to develop a mutually comprehensible approach to the problem of taking earmarks into account in analyzing the annual science budgets. Despite this, the AAAS has done nothing to correct its practice.

*Author's note: The reason the DoD science and technology (S&T) budget changed so much is because earmarks were removed based on the Bush Administration's earmarks reform. It is a mistake, however, to simply interpret that as a drastic cut in the DoD science and technology budget. There were many cases within the DoD earmarks of projects, such as diabetes research, that cannot be regarded as research that the DoD should be undertaking. Cutting such items does not necessarily mean that DoD's essential R&D budget was cut. Earmark reform is a course correction that cuts unnecessary earmarks and provides the relevant agencies with budgets for the important research that they should be doing. The gist of Mr. Marburger's criticism of the AAAS analysis is probably that this point was not sufficiently considered.

3-2 Issues in pharmaceutical and biotechnology R&D

One of the three plenary sessions at this year's forum covered "Pharmaceutical and Biotechnology R&D." This session included a description of the current situation and papers discussing problems in policy challenges for universities, corporations, and research institutes pertaining to productivity and innovation in pharmaceutical-related R&D, intellectual property rights and their effects on R&D, conflicts of interest in biomedical research and policy and ethical challenges in clinical trials. William Haseltine, Chairman of Haseltine Global Health LLC., gave an overview of the pharmaceutical industry, discussing the fact that the number of new drugs approved versus R&D investment has declined markedly. He blamed the stance of major corporations that are developing products for vast markets rather than with the aim of curing disease. He indicated that in corporations the ability to tie ideas to products is being interfered with.

Regarding the issue of productivity in the biomedical field, Scott Stern of Northwestern University pointed out the following paradoxes. (i) Despite enormous investment, the number of FDA approvals of drugs and biomedical agents is still about the same as in the 1980s*3, (ii) despite the dramatic scientific progress of the last 30 years (from genetics to system biology), most therapies and treatments are based on older science and traditional technologies, (iii) although the biotechnology industry includes thousands of large and small companies, most therapies are commercialized by major pharmaceutical companies under the conventional FDA paradigm. Regarding experiments on rapidly developing tailor-made medicine, Mr. Stern pointed out that regulatory frameworks are not keeping pace and argued for the necessity of reforming the regulatory process*3.

John M. Engel of the law firm Engel & Novitt discussed the important role played by intellectual property rights (IPRs) in promoting biomedical R&D. He emphasized that IPRs are becoming increasingly important in private-sector R&D because they are both an essential driving force for innovation that enables private-sector companies to obtain returns on their investments as well as effective safety nets that ease high risks.

In addition, Deborah A. Zarin of the National Library of Medicine discussed public policy and ethical problems in conducting clinical trials. Of more than 40,000 clinical trials today currently underway, 65 percent involve drugs. Many volunteers participate in trials sponsored by the pharmaceutical industry. However, trials may be oriented towards obtaining results rather than towards carrying out accurate scientific experiments, raising questions such as how to protect volunteers from improper risks, how to

decide who has access to the results, and how to verify that the results are accurately assessed. Moreover, the results of most clinical trials go unpublished, and data that are published may be hard to find or contain errors. She pointed out that these are both ethical and scientific problems and argued that policy responses are necessary.

3-3 Sequestered science: (issues regarding concealing and revealing scientific information)

The sequestering of scientific information, the question of whether all science and technology information should be published, was discussed from the perspectives of information sharing, disclosure, and management. Wendy Wagner of the University of Texas indicated that she thinks that while sequestering information for reasons such as protecting research progress or intellectual property, protecting privacy, or guarding from terrorist risks is not improper, disclosure is strongly required when risks to public health are involved, so guidelines that will function effectively in the real world are necessary. Myron Harrison, Senior Health Advisor at Exxon Mobil Corp., indicated that he believes that appropriate measures must be taken to ensure that confidential business information does not harm to the public's health. Furthermore, he used the example of the American Chemical Council's Long-range Research Initiative (LRI; research on the long-term effects of chemicals on human health and the environment), which has the right to release without permission any information regarding risks to the public discovered by LRI researchers. He stated that publishing all results is essential to improving the quality of research, and LRI is a good model of that. (Mr. Harrison defines "sequestered science" as "scientific results that are not readily available to the public.")

3-4 States' expanding roles in science and technology

One of this year's concurrent session themes was "States' Expanding Roles in Science and Technology." Examples of actions by New Mexico, Pennsylvania, California, and Arizona were introduced, and the role of states in scientific and technological progress and the proper form for regional cooperation were discussed.

Thomas Bowles, Science Advisor to the Governor of New Mexico, indicated that his state is home to science and technology centers at several major Federal facilities, such as Los Alamos and Sandia National Laboratories, Phillips Laboratory, and White Sands Missile Range, with an annual R&D budget of $6 billion. He reported that the state has long-term R&D investment and incentive policies in its strong areas of aerospace, biology, energy, and IT, and works at the state level to promote innovation. He emphasized the significance of science and technology policy at the state level as an element driving innovation in New Mexico, saying, "We have the resources, but have lacked a plan and the commitment to make the necessary investments."

In addition, Susan Hackwood, Executive Director of the California Council on Science and Technology (CCST), described how the non-profit CCST provides valuable advice to the State Governor and the Federal Government. Modeled on the National Research Council (NRC), the CCST was founded in 1988. It collaborates widely with California universities, research institutes, and industry, engaging in a variety of initiatives to contribute to the state economy. Education is another of its primary activities. The CCST includes the California Teacher Advisory Council (Cal TAC), which establishes task forces to develop human resources in science and mathematics education. Ms. Hackwood also described trends and issues in science and technology in California.

In the USA, State Governments have developed science and technology strategies to improve science education, support innovation and to invest in R&D to ensure the development of the state economies. The role of State Governments in the development of science and technology in the states has therefore been significant. With the Federal R&D budget stagnating, the role of states is growing larger through efforts to promote

further collaboration among regional industry and to prepare and improve environments supporting creativity and innovation. Furthermore, as can be seen in California's active efforts to tackle environmental issues, in some cases State Governments are proactively taking the place of the Federal Government in addressing global problems. This is a major change of direction.

3-5 Other themes

Other sessions took up the themes of "Building Science, Technology, and Innovation Capacity in Developing Nations" and "Surveillance, Privacy, and the Roles of Science and Technology."

The session on developing nations discussed cases such as the World Bank's program on building science, technology, and innovation capacity and initiatives in Latin America. In addition, Anny Wong of RAND gave an overview of the results of the Global Technology Revolution 2020[7]. This was a survey of global technology trends ranking the ability of 29 countries to acquire and implement 16 key technology applications.

The theme related to surveillance and privacy covered national security issues, which were a major topic in previous forums. This year's subjects for discussion were narrowed down to surveillance technologies and privacy and social issues. Content included discussion of trends in counterterrorism through information and privacy protection technology.

4 Conclusion

This year's policy forum was held amidst strong public interest in the actions of candidates in the coming presidential election and the haggling of President Bush and Congress surrounding the US military in Iraq. Attendees at the forum were most interested in responses to the trend of a declining Federal R&D budget. How to maintain and develop research activities when budgets related to defense development and ACI were being given a high priority while the R&D budgets of other organizations were static or declining was a common subject in the discussions in various the sessions on the role of states in science, problems facing the pharmaceutical industry, and so on.

This year's forum did not hold a special session to discuss environmental issues, in which there was growing interest in Japan after President Bush announced the goal of cutting gasoline use 20 percent over the next 10 years in his January 2007 State of the Union Address and showed signs of aggressively addressing climate change. However, clean energy was one of the themes discussed in last year's forum, and on April 28 the AAAS Board of Directors released a statement on their sense of crisis regarding climate change and distributed it at the forum. The AAAS thus indicated that it still has a strong interest in environmental issues[8].

By bringing key people in science and technology policy, such as Presidential Science Advisor Marburger to meet with the entire scientific community, the AAAS forum plays a historically significant role. It is likely to continue to play this role in the future. It will remain very meaningful to continue Japanese participation in these important policy discussions as a way of gaining an understanding of the major issues related to US science and technology policy.

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Glossary

*1 The AAAS is the world's largest non-profit organization for scientists, engineers, science educators, policymakers, and so on, with over 140,000 members. It is well-known as the publisher of the journal Science.

*2 Earmarks differ from competitively selected funds in that they are selected

by debate over their intended use. They have increased rapidly in the past few years and are widely used to bring pork-barrel funds to the districts of members of Congress. The lack of transparency in the process and the way they can interfere with funding mechanisms for important research are seen as problems within the Administration. In his January 2007 State of the Union Address, President Bush proposed comprehensive reform to make the earmark process transparent and accountable through steps such as making all earmark information available to Congress and cutting earmark funding in half[5]. The funding resolution passed in February 2007 included a moratorium on earmarks that temporarily froze all earmarks. As part of the reform, all future earmarks will probably be more carefully selected. According to the OMB, which is building a database on earmarks, in FY 2005 alone, they numbered 13,497 for over $19 billion. The DoD accounted for more than half that number.

*3 The report "Innovation or Stagnation: Challenge and Opportunity on the Critical Path to New Medical Products" released by the US Food and Drug Administration (FDA) in March 2004 pointed out similar issues[6]. It indicated that the number of applications for approval of new drugs has fallen dramatically in recent years, and that despite the expectations of the biomedical revolution, new scientific discoveries are not being converted to the development of safe and effective drugs. As causes, the report cites today's more challenging, inefficient, and expensive drug development path, along with the failure of the applied science required for drug development to keep pace with the marvelous progress of basic science. The report states that new scientific and technical methods such as animal or computer-based predictive models, biomarkers for safety and effectiveness, and new clinical evaluation techniques -- are urgently needed to improve predictability and efficiency along the critical path from laboratory concept to commercial product.

References

[1] For information on past forums, see: "Science and Technology Trends in the United States: Report on the AAAS Annual Forum on Science and Technology Policy," Science and Technology Trends-Quarterly Review, No. 13, October 2004 and "Report on the Annual AAAS Forum on Science and Technology Policy," Science and Technology Trends- Quarterly Review, No. 21, October 2006:
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[2] For the forum program and materials presented, see the 32nd Annual AAAS Forum on Science and Technology Policy website:
http://www.aaas.org/spp/rd/forum.htm.

[3] See "A Preview of AAAS Report XXXII: Research and Development FY 2008":
http://www.aaas.org/spp/rd/prev08p.htm.

[4] Regarding OECD initiatives, see the report on the "Workshop on Science of Science Policy: Developing our Understanding of Public Investments in Science" in the August 2006 NISTEP News (Japanese):
http://www.nistep.go.jp/NISTEP_News/news214/news214.html

[5] State of the Union 2007: http://www.whitehouse.gov/stateoftheunion/2007/index.html

[6] http://www.fda.gov/oc/initiatives/criticalpath/whitepaper.html#execsummary

[7] For the full report, see: http://www.rand.org/pubs/technical_reports/TR303/.

[8] "AAAS Board Statement on The Crisis in Earth Observation from Space," 28 April 2007 quotes the National Research Council (NRC) report "Earth Science and Applications from Space" (2007), which

states that "the United States' extraordinary foundation of global observations is at great risk" by 2010 and warns of major data gaps if cuts in funding for global observation satellite related funding continue:
http://www.aaas.org/news/releases/2007/media/aaas_board_eos_statement.pdf

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